CLAIMS

What is claimed is:

1. A hopper for dispensing bulk material from a storage structure, the hopper comprising:

a side wall having an interior surface that bounds a progressively constricting flow channel extending from an enlarged first end to a constricted second end, the interior surface being curved along a plane extending between the enlarged first end the constricted second end, the side wall being comprised of a cementitious material.

2. A hopper as recited in claim 1, wherein the interior surface inwardly curves in a convex configuration between the enlarged first end the constricted second end.

3. A hopper as recited in claim 1, wherein the interior surface has a substantially constant radius of curvature along the plane extending between the enlarged first end the constricted second end.

4. A hopper as recited in claim 1, wherein the interior surface has a plurality of different radius of curvatures along the plane extending between the enlarged first end the constricted second end.

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5. A hopper as recited in claim 1, wherein the interior surface comprises a smooth surface having a gradually changing radius of curvature extending between the enlarged first end the constricted second end.

6. A hopper as recited in claim 1, wherein the flow channel has a substantially circular transverse cross section.

7. A hopper as recited in claim 1, wherein the side wall is comprised of a flexible form.

8. A hopper as recited in claim 7, wherein the flexible form is comprised of one or more panels of a flexible sheet.

9. A hopper as recited in claim 1, further comprising a surface hardening coating disposed on the interior surface of the side wall.

10. A storage structure assembly comprising:

a hopper as recited in claim 1;

a storage structure bounding a compartment, the enlarged first end of the hopper being secured to the storage structure so that the flow channel communicates with the compartment; and

a bulky feeder coupled with the constricted second end of the hopper.

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11. A storage structure assembly as recited in claim 10, further comprising a tubular conduit extending between the constricted second end of the hopper and the bulky feeder.

12. A storage structure assembly as recited in claim 10, further comprising a support member mounted to the storage structure, the support member being comprised of a cementitious material and be integrally formed with the first end of the hopper so as to support the hopper.

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13. A hopper for dispensing bulk material from a storage structure, the hopper comprising:

a side wall having an interior surface that bounds a progressively constricting flow channel extending from an enlarged first end to a constricted second end, the side wall being comprised of:

a flexible form;

a cementitious material disposed on the flexible form; and

reinforcing embedded within the cementitious material.

14. A hopper as recited in claim 13, wherein the flexible form is comprised of two or more flexible panels that are secured together.

15. A hopper as recited in claim 13, wherein the flexible form is comprised of a flexible sheet.

16. A hopper as recited in claim 15, wherein the flexible sheet is comprised of a polymeric material, fabric, woven material, mesh, chain link, composite material, or combinations thereof.

17. A hopper as recited in claim 13, wherein the interior surface inwardly curves in a convex configuration.

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18. A storage structure assembly comprising:

a hopper as recited in claim 13;

a storage structure bounding a compartment, the enlarged first end of the hopper being secured to the storage structure so that the flow channel communicates with the compartment; and

a bulky feeder coupled with the constricted second end of the hopper.

19. A storage structure assembly as recited in claim 18, further comprising a tubular conduit extending between the constricted second end of the hopper and the bulky feeder.

20. A storage structure assembly as recited in claim 18, further comprising a support member mounted to the storage structure, the support member being comprised of a cementitious material and be integrally formed with the first end of the hopper so as to support the hopper.

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21. A method for forming a hopper assembly in a storage structure, the method comprising:

mounting a form to a storage structure which bounds a compartment, the form having an exterior surface; and

spraying a layer of cementitious material over the exterior surface of the form so as to produce a rigid side wall, the rigid side wall having an interior surface bounding a progressively constricting flow channel that communicates with the compartment of the storage structure.

22. A method as recited in claim 21, wherein the form is rigid.

23. A method as recited in claim 21, wherein the form is flexible.

24. A method as recited in claim 23, wherein the flexible form is comprised of a flexible sheet of material.

25. A method as recited in claim 23, wherein the flexible form is comprised of two or more panels that are secured together.

26. A method as recited in claim 21, further comprising securing a tubular sleeve to a second end of the form prior to spraying the layer of cementitious material.

27. A method as recited in claim 26, wherein the tubular sleeve is freely suspended by the flexible form while spraying the layer of cementitious material.

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28. A method as recited in claim 26, wherein the act of spraying the layer of cementitious material further comprises applying the layer of cementitious material over a portion of the tubular sleeve.

29. A method as recited in claim 21, further comprising securing a bulky feeder to the rigid side wall so that the bulky feeder communicates with the flow channel.

30. A method as recited in claim 21, wherein the form when mounted to the storage structure has an interior surface that bounds the progressively constricting flow channel.

31. A method as recited in claim 21, further comprising at least substantially removing the form from the rigid side wall.

32. A method as recited in claim 21, further comprising applying a surface hardening coating over the interior surface of the rigid side wall bounding the flow channel.

33. A method as recited in claim 21, wherein the form is mounted to the storage structure such that when the layer of cementitious material is sprayed over the exterior surface of the form, the interior surface of the rigid side wall inwardly curves in a convex configuration.

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34. A method for retrofitting a hopper assembly into an existing storage structure, the method comprising:

removing at least a portion of an existing hopper from a storage structure that bounds a compartment;

mounting a first end of a form to the storage structure such that a progressively constricting flow channel bounded by an interior surface of the form communicates with the compartment of the storage structure; and

applying a layer of cementitious material over an exterior surface of the form so as to produce a rigid side wall bounding the flow channel.

35. A method as recited in claim 34, wherein the act of removing at least a portion of an existing hopper comprises removing a lower portion of the existing hopper so than an annular upper portion of the existing hopper remains attached to the storage structure.

36. A method as recited in claim 35, wherein the form is attached to the storage structure so that the form at least partially passes through the upper portion of the existing hopper.

37. A method as recited in claim 34, further comprising securing a tubular sleeve to a second end of the form prior to applying the layer of cementitious material.

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38. A method as recited in claim 37, wherein the act of applying the layer of cementitious material further comprises applying the layer of cementitious material over a portion of the tubular sleeve.

39. A method as recited in claim 34, further comprising securing a bulky feeder to the rigid side wall so that the bulky feeder communicates with the flow channel.

40. A method as recited in claim 34, further comprising at least substantially removing the form from the rigid side wall.

41. A method as recited in claim 34, wherein the form is mounted to the storage structure such that when the layer of cementitious material is applied over the exterior surface of the form, the interior surface of the rigid side wall inwardly curves in a convex configuration.

42. A method as recited in claim 34, wherein the form is flexible.

43. A method as recited in claim 34, wherein the layer of cementitious material is sprayed over an exterior surface of the form.

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